

Precision CMOS Clock Oscillator for HI-G Applications

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Summary of Discussion

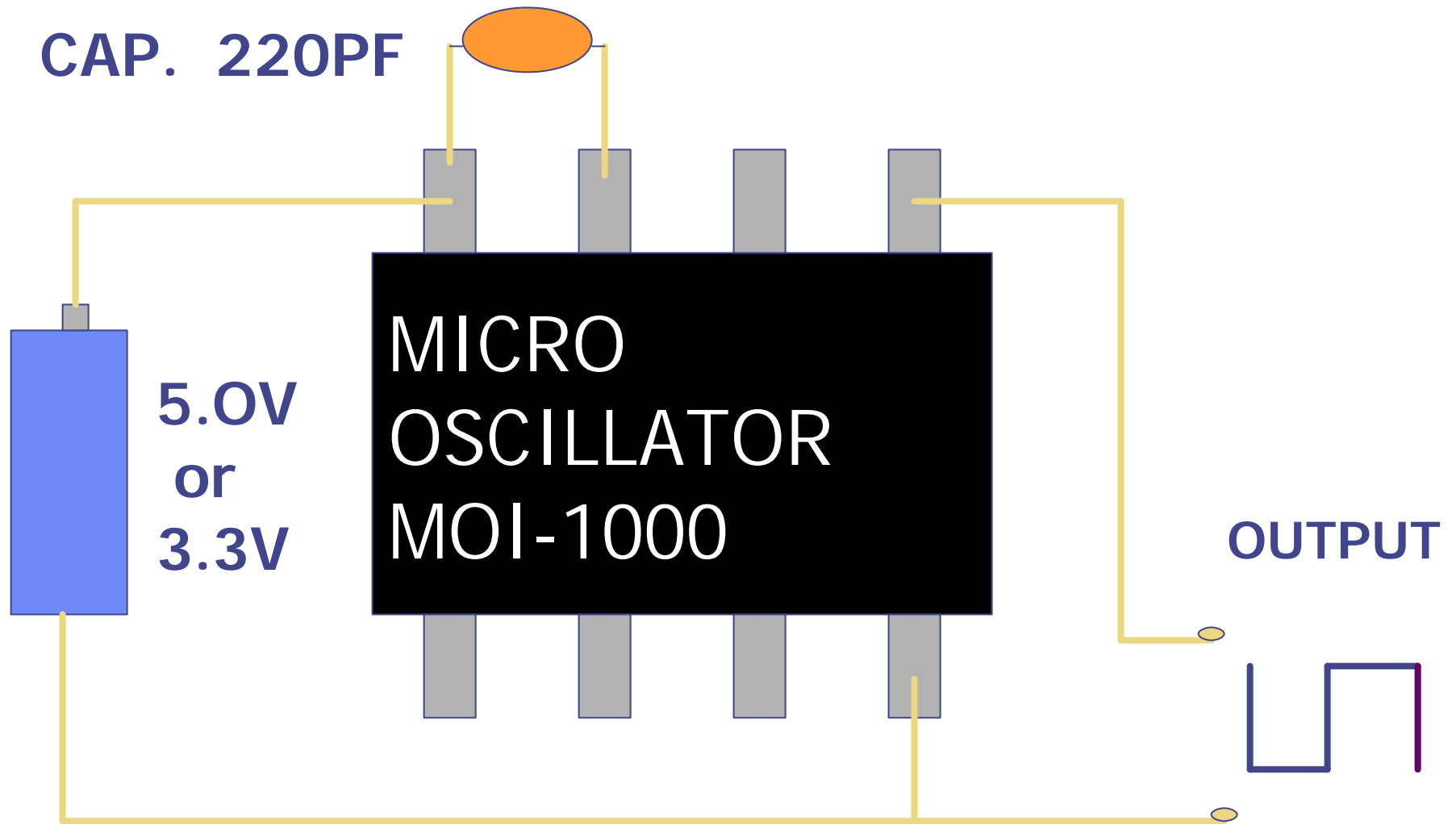
- ◆ MOI-1000 CLOCK OSCILLATOR
- ◆ COMPARISON OF OSCILLATOR TYPES
- ◆ SBIR AF98-220
- ◆ MOI-2000 CLOCK OSCILLATOR
- ◆ Proposed 32.7KHZ Oscillator
- ◆ Summary & Recap

MOI-1000 Clock Oscillator

- *Smallest*
- *Fastest Turn On*
- *Most Rugged*
- *Lowest Power*



OSCILLATOR CIRCUIT

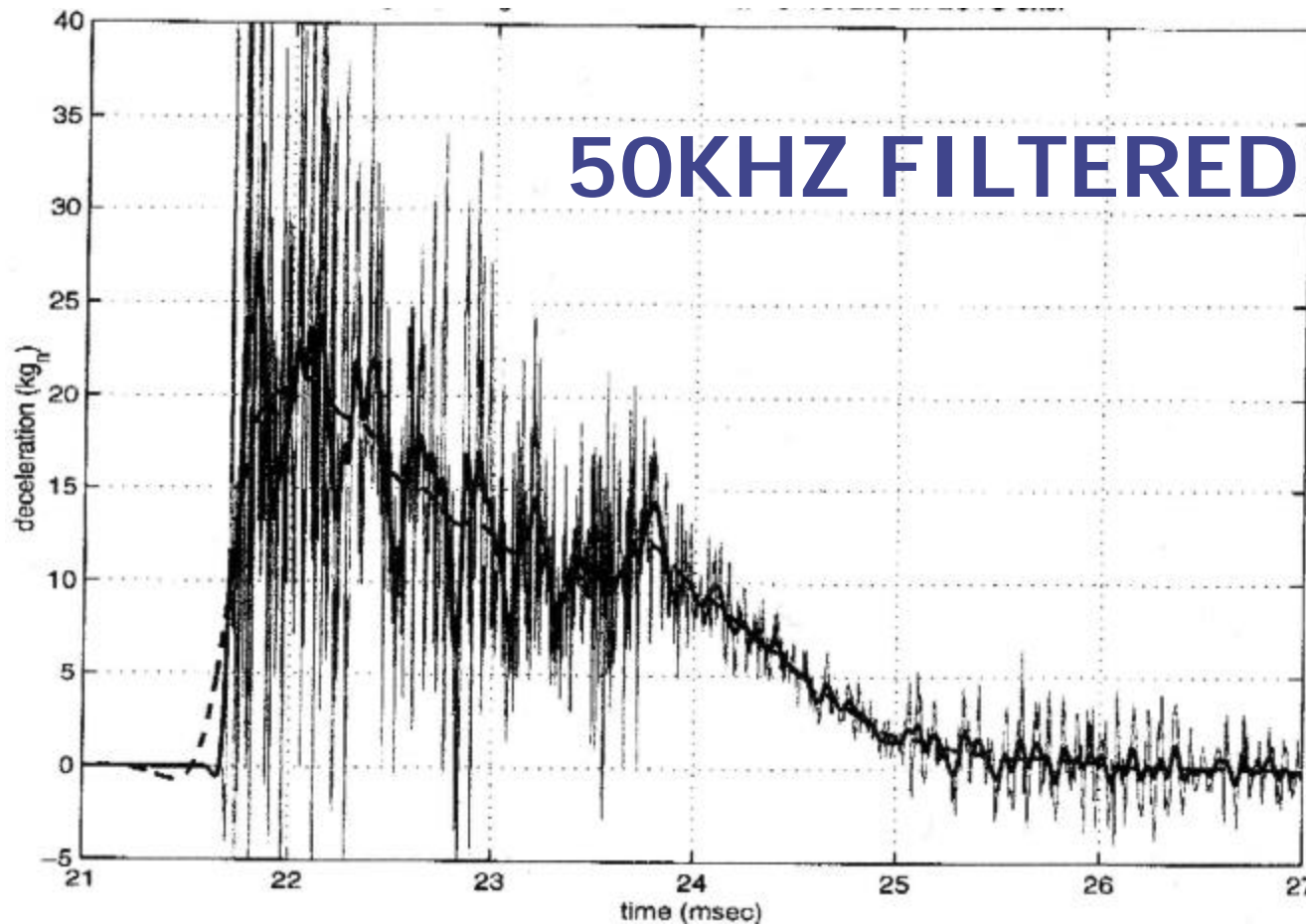


MOI-1000 SPECIFICATION

CMOS IC

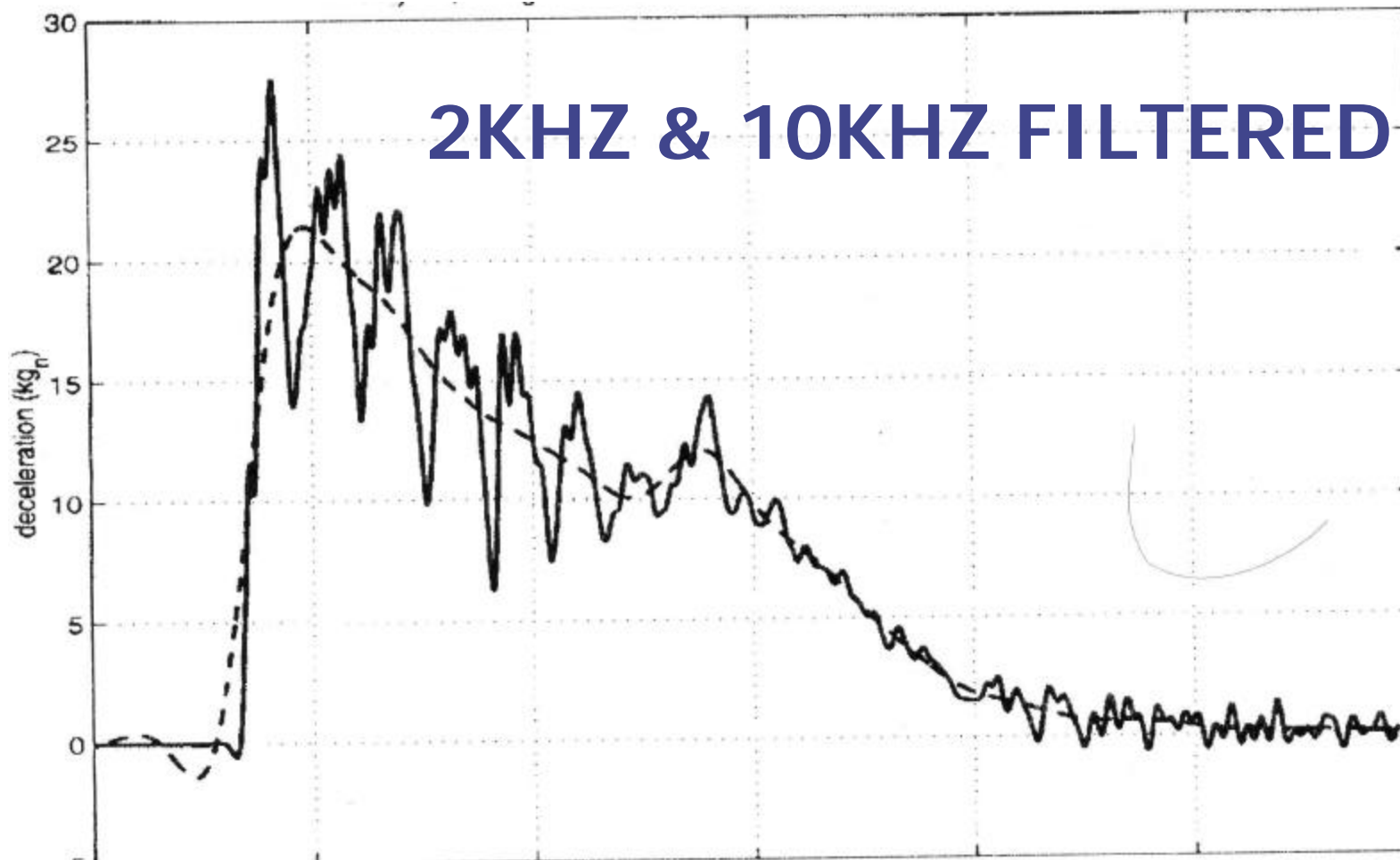
SIZE	1.7 X .9 MM
FREQUENCY	16, 20, 24 MHz
FREQUENCY ACCURACY (Temp. & Voltage, Etc.)	
INDUSTRIAL TEMP	0.5%
MILITARY TEMP	1.0%
OPERATING POWER	(5.0V) 25 mW
	(3.3V) 10 mW
OUTPUT, SQUARE WAVE SYMMETRY	55/45%
SHOCK, OPERATIONAL	> 80,000 G
PACKAGE	SO-8, MSO-8 or Bare Die

MOI-1000 ACCELERATION TEST (UNIT OPERATING)



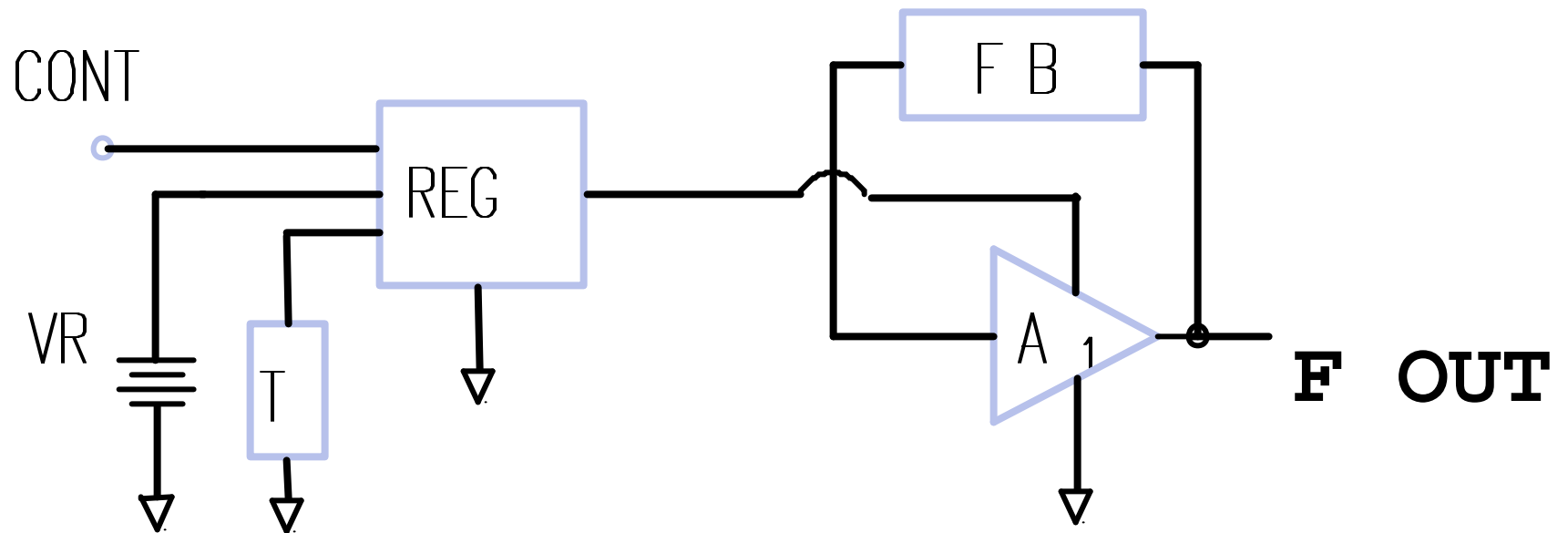
155 MM HOWITZER, CONCRETE WALL
PLOT CURTESY OF AFRL/MNMF

MOI-1000 ACCELERATION TEST (UNIT OPERATING)

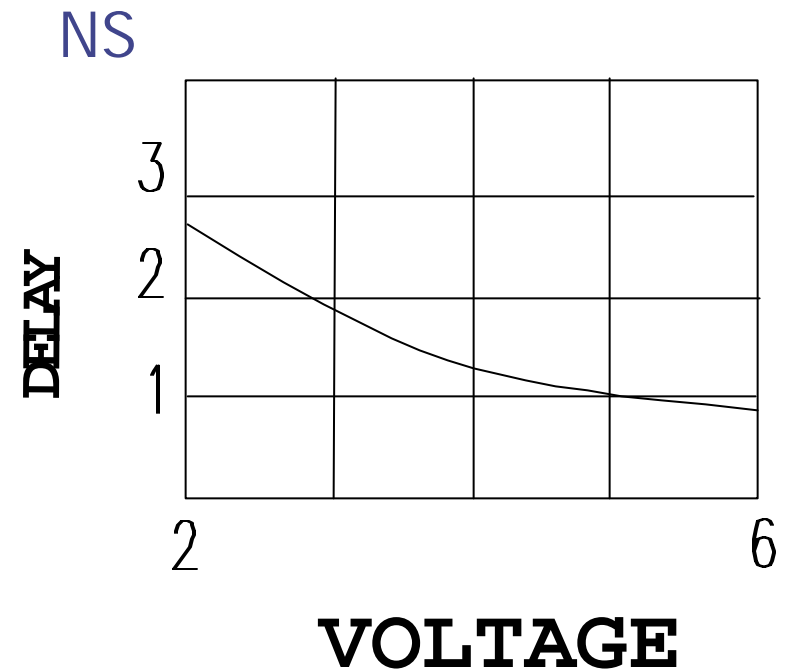
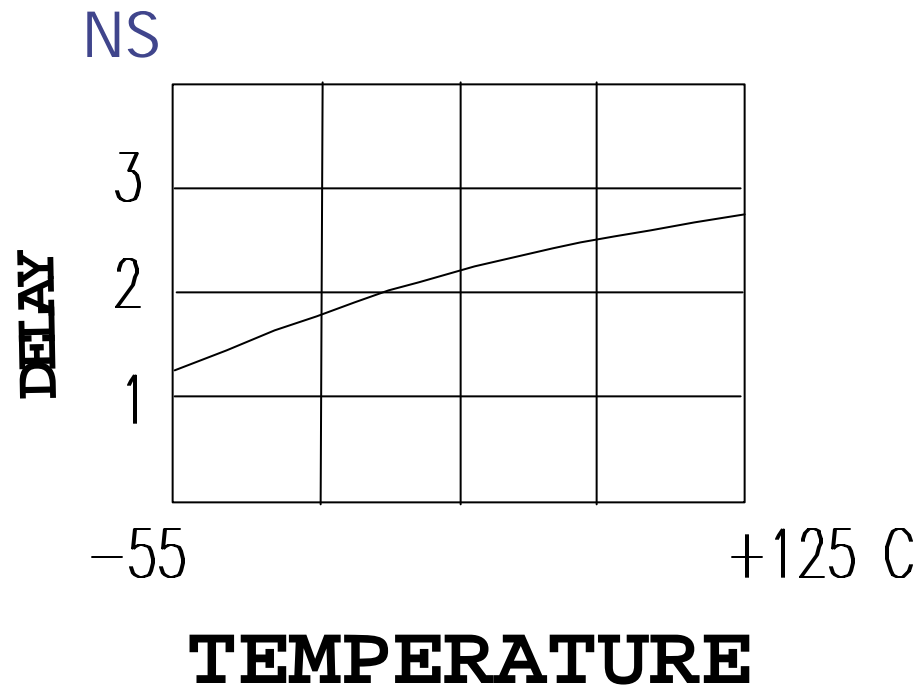


**155 MM HOWITZER, CONCRETE WALL
PLOT CURTESY OF AFRL/MNMF**

MOI-1000 CLOCK OSCILLATOR SYSTEM BLOCK DIAGRAM



PROPAGATION DELAY TIME VARIATIONS



CLOCK OSCILLATOR COMPARISON CHART

	MICRO OSCILLATOR	CRYSTAL CLOCK	CERAMIC RESONATOR
FREQ. TOL.	MEDIUM	HIGH	MEDIUM
SIZE (mm)	.9 x 1.7	5 x 7	2.8 x 6.5
HYBRID	YES	NO	NO
RUGGEDNESS	VERY HIGH	LOW	MEDIUM

MOI-1000 ADVANTAGES

- 1: COMPLETE CLOCK OSCILLATOR
- 2: SMALL SIZE, BARE DIE OR S0-8
- 3: NO START UP PROBLEMS
- 4: NO FREQUENCY JUMPING
- 5: 3.3 V OR 5.0 V AVAILABLE
- 6: +/- 0.5% TOLERANCE INDUSTRIAL
- 7: +/- 1.0% TOLERANCE MILITARY

MOI-1000 DISADVANTAGES

- 1: NOT AS ACCURATE AS CRYSTAL

EXISTING APPLICATIONS

PROGRAMMABLE PROJECTILE FUZE

CRITICAL REQUIREMENTS MET-
OPERATIONAL IN HIGH G ENVIRONMENT
FAST TURN ON TIME
BARE DIE FOR HYBRID PACKAGING
LOW OPERATING POWER

HARD TARGET FUZING

CRITICAL REQUIREMENTS MET-
OPERATIONAL IN HIGH G ENVIRONMENT
LOW OPERATING POWER

SBIR AF98-220

PURPOSES:

1) IMPROVE MOI-1000:

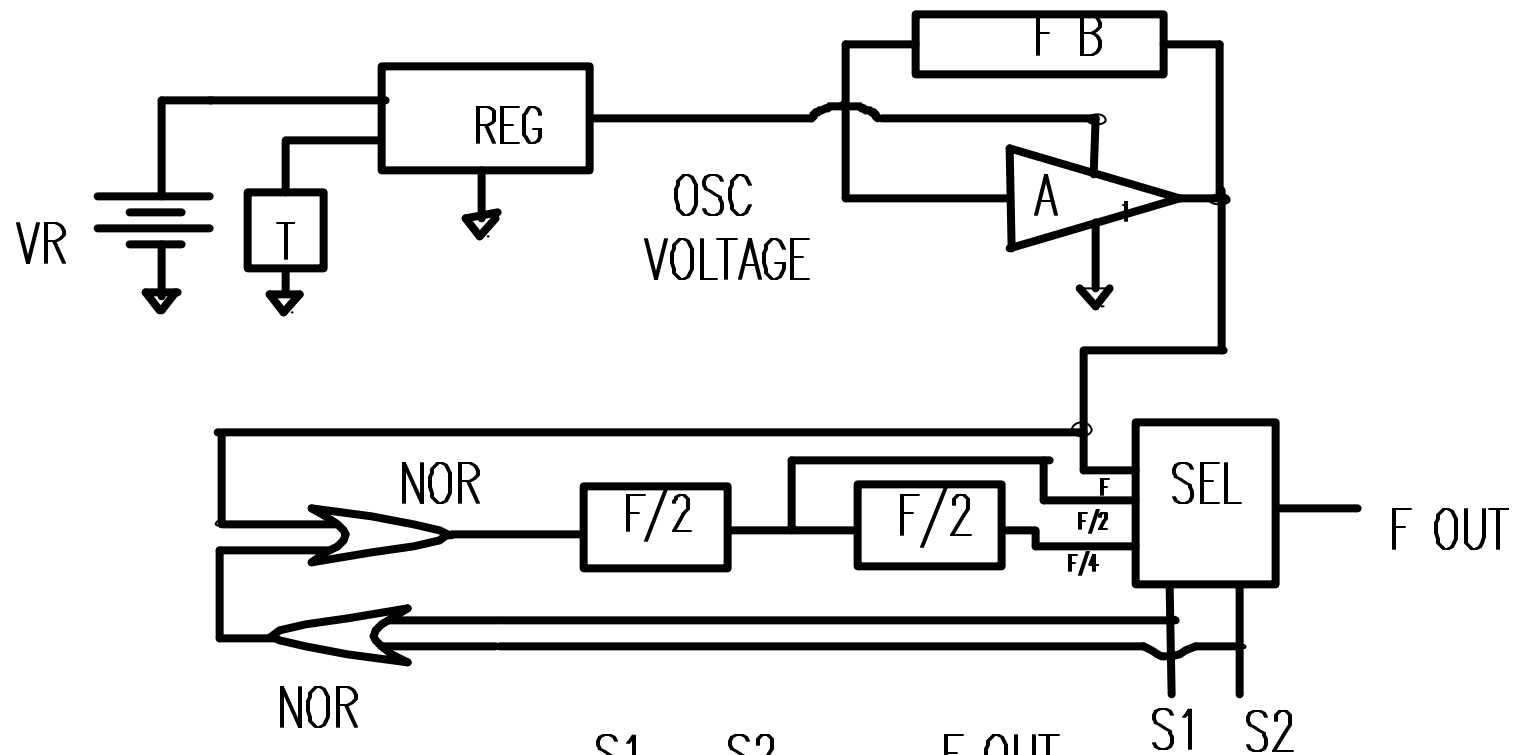
REDUCED OPERATING POWER
WIDER FREQUENCY RANGE

2) DEVELOP 32.7KHZ VERSION

SBIR TIMER BASE SYSTEM SPECIFICATION

	SYSTEM 1	SYSTEM 2
VOLTAGE	5V $\pm 5\%$	3.3V $\pm 5\%$
CURRENT	1 MA MAX	1 MA MAX
FREQ. TOL.	$\pm 1\%$ ABSOLUTE	$\pm 1\%$ ABSOLUTE
FREQ. RANGE SINGLE FREQ.	14.0 TO 20.0 MHZ	3.5 TO 5.0 MHZ
OPERATING TEMP.	-55 TO 125 °C	-55 TO 125 °C
OUTPUT DRIVE	2 HC CMOS	2 HC CMOS

MOI-2000 CLOCK OSCILLATOR SYSTEM BLOCK DIAGRAM



S1	S2	F OUT
0	0	F
1	0	F/2
0	1	F/4

COMPARISON OF MOI-1000 TO MOI-2000

MOI-1000

MOI-2000

FREQ.

14 to 24MHz

4 to 20 MHz

CURRENT

5.0 VOLTS

5mA

1.6mA

3.3 VOLTS

3mA

1ma

TOL.

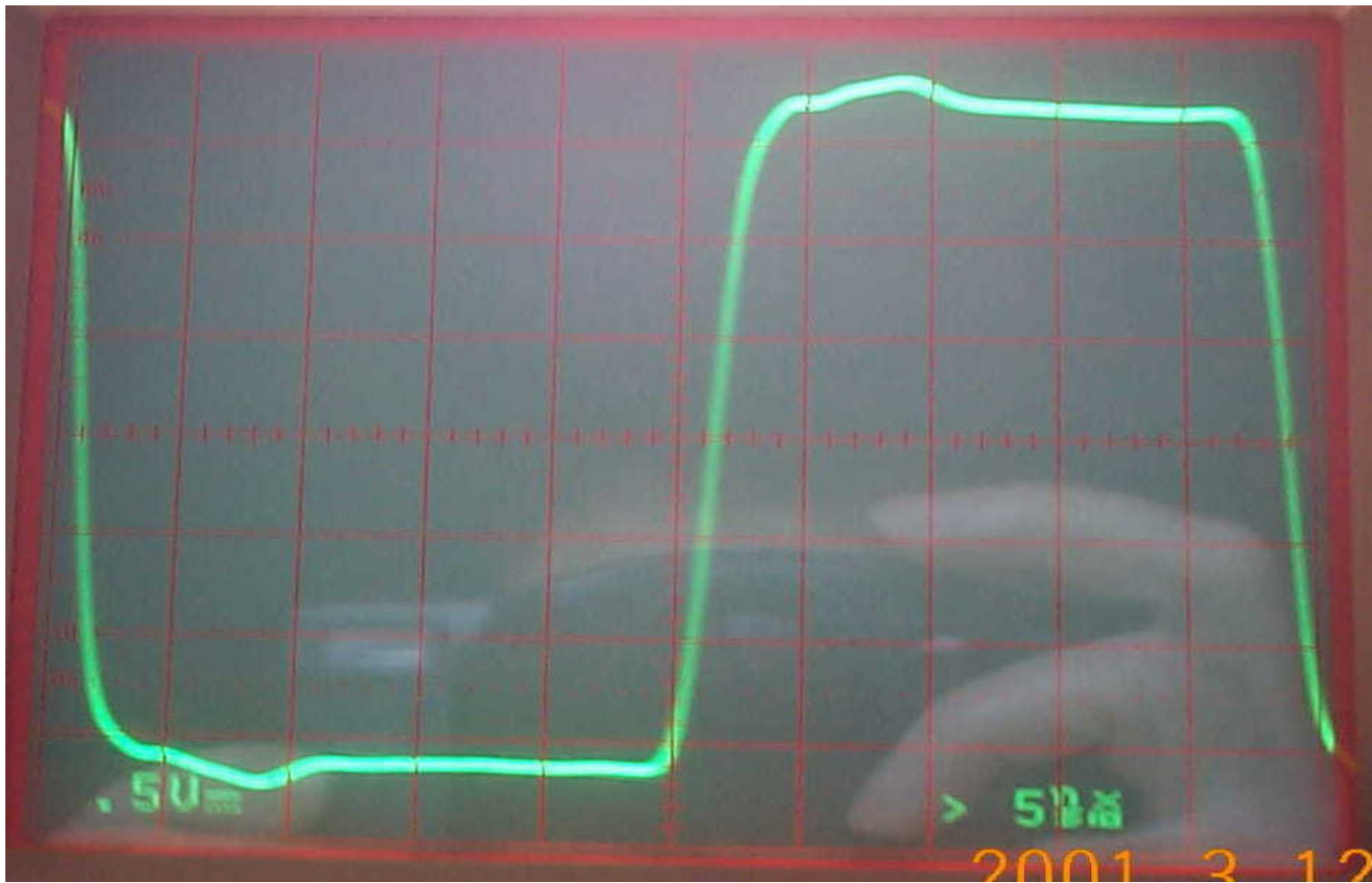
+/-1%

+/-1%

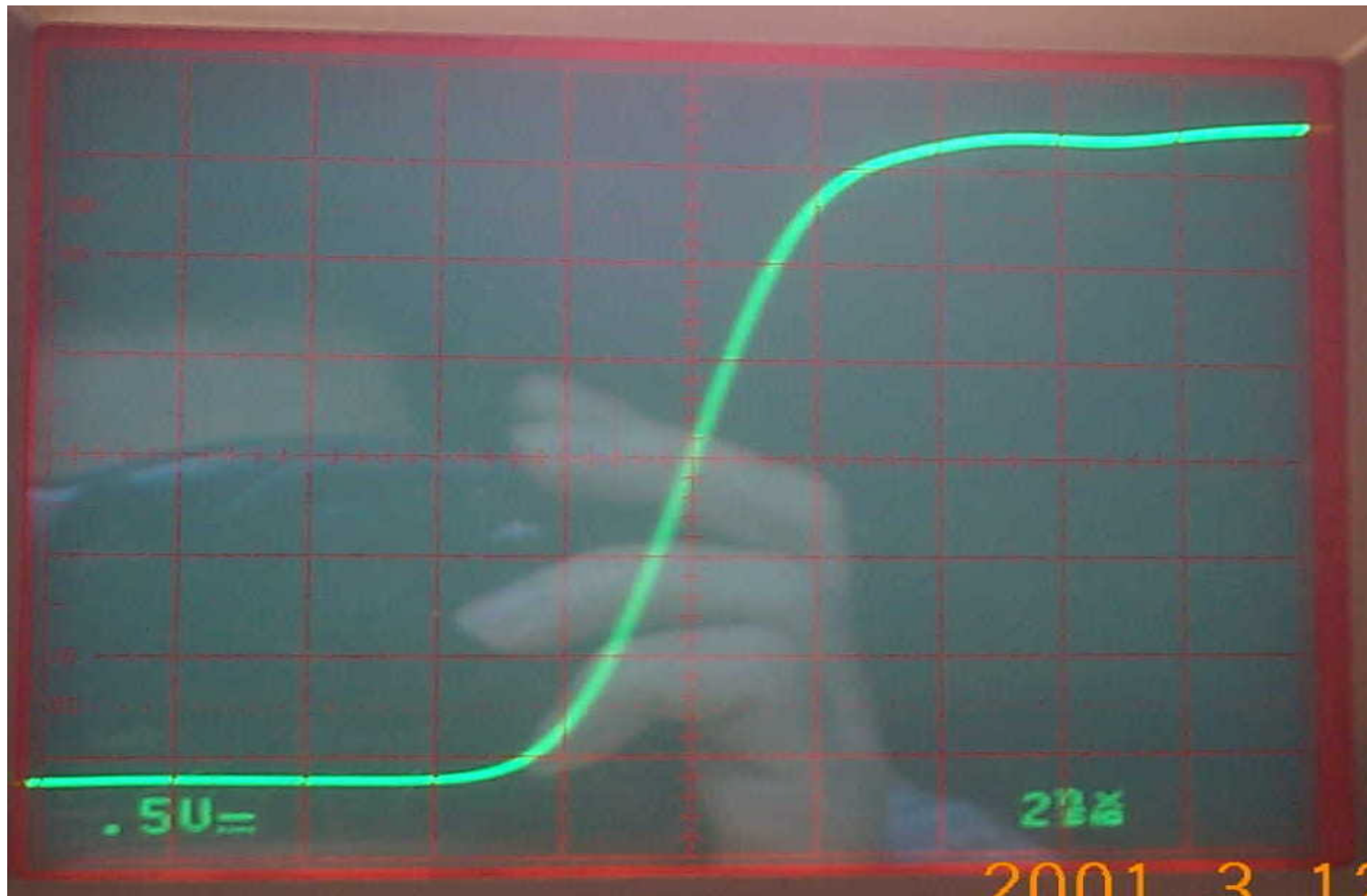
MOI-2000 PREPRODUCTION MEASURED PERFORMANCE

VOLTAGE	5	3.3
CURRENT	2.2 Ma	1.4 Ma
FREQUENCY	16 MHz	10 MHz
FREQ. TOL.		
-55 - 125°C	± 1.0%	± 1%

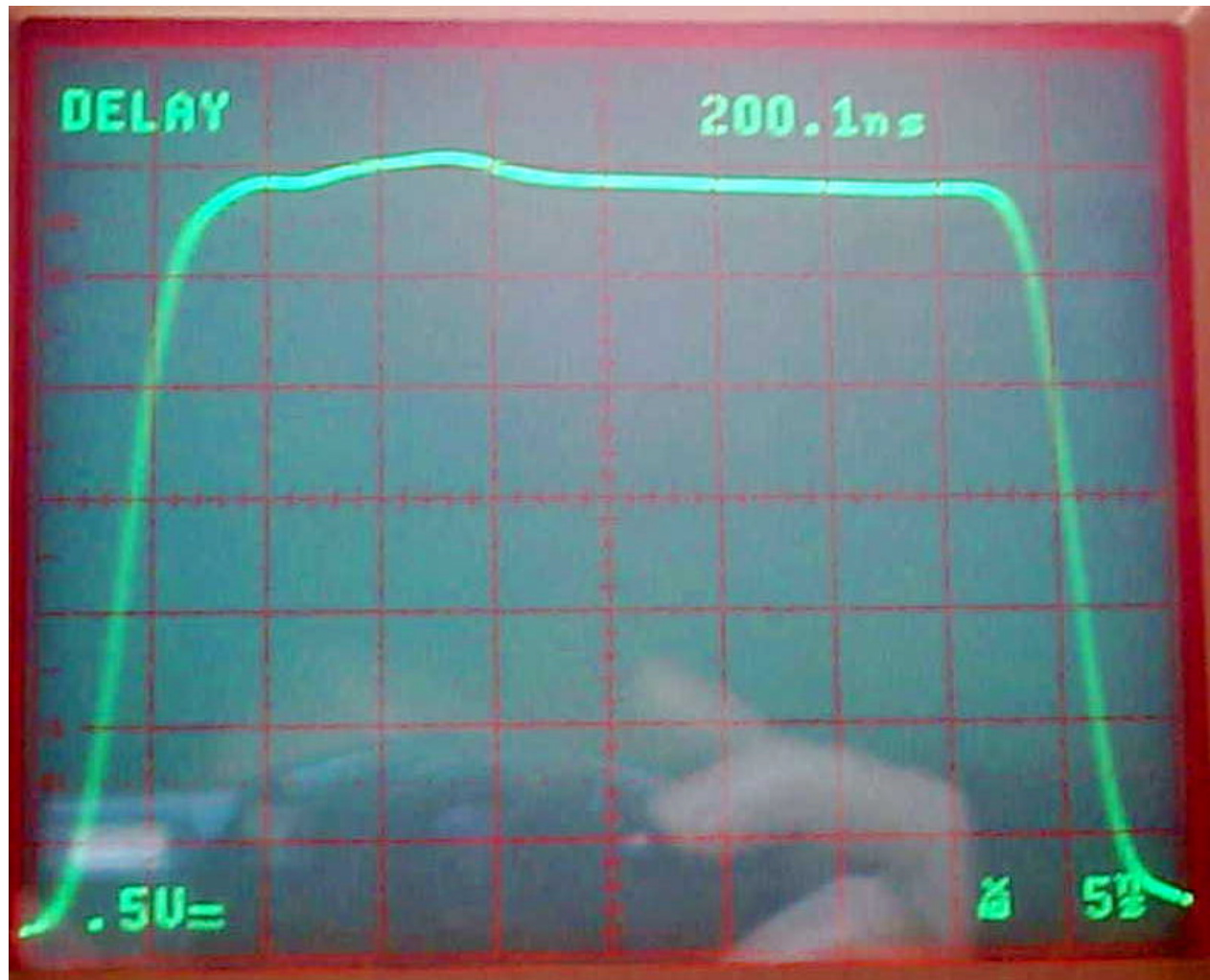
MOI-2000 OSCILLATOR OUTPUT 3.3V 12PF LOAD, 53/47% DUTY CYCLE



MOI-2000 OSCILLATOR OUTPUT
3.3V 12PF LOAD, 2 NSEC/DIV



MOI-2000 OSCILLATOR OUTPUT DELAYED 3.3V 12PF LOAD



32.7 KHz TIME BASE SYSTEM SBIR SPECIFICATION

Operating Voltage	3.3v or 5V 5%
Operating Current	0.2 ma max
Frequency Tol.	+/- 1%
Frequency	32.7 KHz
Operating Temp.	-55 to 125 c
Package	S0-8

OSCILLATOR AVAILABILITY SCHEDULE

MOI-2000

5V

JULY 2001

3.3V

NOW

32 .7KHz

JULY 2002

Summary & Recap

MOI-1000

5 YEARS OF PROVEN
PERFORMANCE IN
HI-G APPLICATIONS

MOI-2000

SAME PROVEN TECHNOLOGY AS
MOI-1000 AT A MUCH LOWER
OPERATING POWER LEVEL